Assessing Voice Interaction As An HMI Input Method For In-Vehicle Infotainment Systems & Future Opportunities With Cloud-Based Voice Interaction

Duncan Robertson
Jaguar Land Rover Research
Contents

• Background
• Comparison with other input methods
• What’s the impact on safety?
• Cloud-based voice
• The future
Background
Background

Very simply...

Controls incorporated into displays
HMI Input Devices

- Physical buttons
- Touchscreen
- Rotary Controller
- Voice
- Gesture
- Touchpad
Touchscreens

Positive
• Consumer expectations
• Direct, fast, input
• Reduced footprint
• Short, discrete tasks.

Challenges
• Reflections / fingerprints
• Restricts design
• Lack of feedback
• Manipulation of lists
• Hierarchical structure
Rotary Controllers

Positive
• Screen can be shaded
• More design freedom
• Comfort (ergonomics)
• Manipulation of lists

Challenges
• Adds cognitive element to the task
• Adds switchgear
• Character entry
• Map manipulation
• Interface design
Voice

Positive
• Direct access
• Good for big data
• Complex tasks
• Eyes on the road & hands on the wheel

Challenges
• Structured
• Recognition rates vs. steps
• Misinterpretation
• Embarrassment
• Cognitive distraction
HMI Input Devices

Multi-modal approach

Touchscreen

Voice
Voice and Safety

• Barón & Green, 2006 (UMTRI) – 15 paper literature review on use of voice.
• Tasks evaluated, while driving -
  • Music selection
  • Email processing
  • Phone dialling
  • Destination entry
Voice and Safety

• Generally, driving performance is better.
  • Fewer lane departures
  • Steadier speed
• Workload is less.
• Less time spent looking away from the road.

• Task performance is usually better for speech, but there are exceptions.
Voice and Safety

- AAA Foundation – Measuring cognitive distraction in the Automobile.
- “Strong evidence that drivers are not necessarily safe just because eyes are on the road and hands are on the wheel”.

Voice and Safety

Source: AAA Foundation
Cloud Based Voice Interaction

1. User activates voice
2. User speaks
3. Audio sent to dictation server
4. Text is analysed
5. Appropriate system response is determined.
6. Response is sent to vehicle.
Cloud Based Voice Interaction

Positives

• Ability to remotely update databases.
• Ability to evolve interface based on real world usage.
• Ability to access real time data.
• Migrateable, cross-vehicle solution.

Challenges

• Quality of service
• Delays
• Drop-outs
The Future

- Increased potential in the medium term.
- Increased functionality.
- Increased push towards natural language.
- Hybrid on-line voice systems.
- Opens up the opportunity for the new features.

Source: Strategy Analytics 2012
Thank you for listening.

Duncan Robertson
drobe123@jaguarlandrover.com
References

• Schreiner (2012). “Automotive HMI Trends: Natural Language and Touchscreens Required for Connectivity”. Strategy Analytics
References

Other comparison studies

Other comparison studies


Other comparison studies

Acknowledgements

• Lewis Mowatt, Lewis Mowatt Solutions
• Dr Catherine Harvey, Transportation Research Group, University of Southampton